TIEBACK ANCHORS

CHANCE®

Choose Screw Anchors for Tiebacks

Since the 1950's, A.B. Chance has been manufacturing multi-helix screw anchors. These anchors have established a consistent record of performance through extensive use in the tieback, electric-utility and petroleum industries. Construction applications for screw anchors in retaining-wall tiebacks continue to grow.

Screw Anchor Advantages

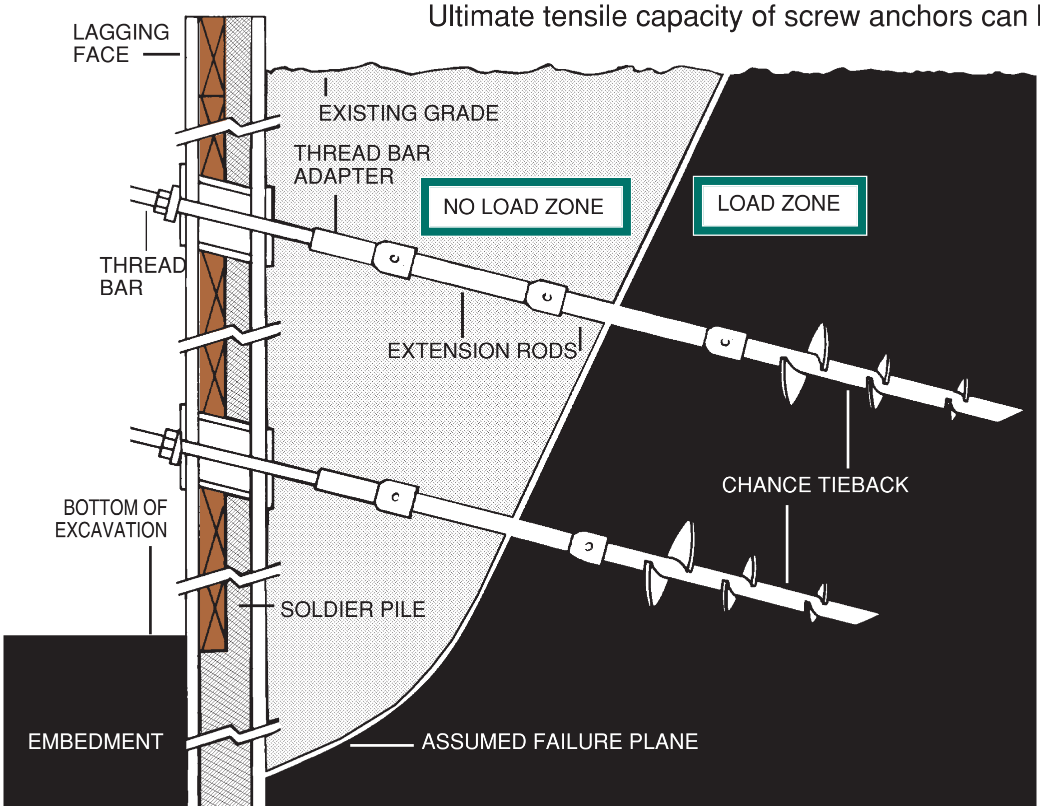
Several factors contribute to the lower installed costs of screw anchors:

- May be installed with conventional rotary drilling equipment used in grouted-anchor tieback construction.
- Faster to install. No drilling or spoils removal. Typical installing time is 20 to 30 minutes.
- Immediate testing following installation since grouting is eliminated.
- Monitoring torsional resistance during installation gives an indication of soil strength that can relate to anchor load capacities and help prevent overstress.
- Screw anchors can be withdrawn and reused.

The screw anchor's advantage is how it removes the performance uncertainties and costs associated with a grouted anchor when used in loose sandy soils and low-shear-strength clay soils. When placed in the soil, the screw anchor acts as a bearing device. This is a fundamental difference compared to a grouted anchor formed in soil and reliant on friction between the soil and grout.

Collapse of a prepared hole can change a grouted anchor's dimensions. There is little opportunity to assess the problem's magnitude and exact location because it is in the hole, out of sight. Protecting grout from such an occurence adds the extra costs of installing casing. A screw anchor averts these drawbacks by requiring neither an open hole nor a casing.

Ultimate tensile capacity of screw anchors can be as high as 200 kips.



Installation torque limitations may preclude the application of screw anchors in some extremely-dense soils. Torque-monitoring during screw-anchor installation provides a means of quality control. It can disclose valuable information where subsurface conditions vary significantly from those anticipated.

Anchorage Design Criteria

Anchorage design can typically be divided into two steps:

1. Select anchor-helix configuration based on soil characteristics and tension load.
2. Select shaft configuration based on tension load and anticipated installation torque.

Capacity Equation

The design procedure utilized by A.B. Chance is an iterative process based upon the well-known General Bearing Capacity Equation:

$q_u = c\ N_c + \bar{q}\ N_q$

where

q_u = ultimate soil bearing pressure

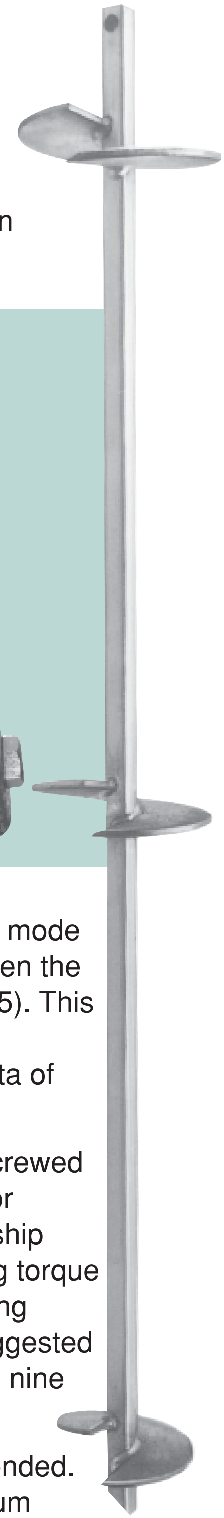
c = cohesion of soil

$\bar{q}$ = overburden pressure

N_c, N_q } bearing capacity factors for local shear conditions

The solution of this equation is dependent upon the interpretation of the soil test data to obtain the necessary factors. And, upon the quality of that data depends the quality of the results.

Empirical data indicates that when spacing between helices is adequate, the load capacity of a multi-helix anchor is the sum of all individual helix bearing capacities. The bearing capacity of each helix is a product of its projected area (A_h) and the bearing pressure (q_u). Load capacity due to skin friction along the shaft is negligible. Deduction in load capacity should be accounted for in sensitive soils and when using anchors with an unusual number of helices.



Anchor Lead Section

Helices, from 6- through 14-inch diameters, are welded on a steel shaft. Each helix acts as a separate anchor for maximum holding capacity.

Thread Bar Adapter

Specially-threaded for thread bar, adpater has integral socket to connect to anchor shaft. Adapters can be made compatible with thread bar by all major manufacturers. Each tieback typically requires 5 feet of thread bar from the retaining wall to the anchor, including sufficient length for load jacks and lock-off nuts.

The foregoing analysis is dependent upon a “deep-anchorage” mode of failure, both vertically and along the shaft. This will occur when the top helix depth divided by the top helix diameter exceeds five (5). This is what A.B. Chance recommends. The designer should make allowances when the zone of influence on a helix includes strata of different strengths.

Rotational resistance encountered by an anchor while being screwed into the soil is defined as installation torque. Estimates given for installing torque are based largely on experience. The relationship between anchor configuration, soil characteristics and installing torque has been inferred from empirical data. The ratio between holding capacity in pounds and installation torque in foot-pounds is suggested as 10 for a “rule of thumb.” This value may typically range from nine (9) to 11.

Monitoring of torque throughout anchor installation is recommended. Installation torque must not exceed the anchor rating. A minimum torque level should be calculated for each application to ensure anchor holding capacity. This provides a safeguard against termination in soils with characteristics different from assumptions used in the design of anchor helix configuration.

Torque monitors are available from A.B. Chance with hydraulic or mechanical readout. A.B. Chance also offers all the drive-train tools needed to adapt drilling equipment for installing anchors.

Tieback Anchor Selection

For retaining projects, Chance® screw anchors can be matched to soil and heavy tension loads in the same way Chance® Helical Pier Foundation System anchors are for compression applications.

Typical applications include building-site preparation, roadways, retaining walls, levees, dams and revetments.

The usual number of helices on the anchor shaft is four or less. These are welded to a round-cornered square-steel shaft available in four cross-sectional sizes. Nominal helix diameters are 6, 8, 10, 12 and 14 inches. These square-shaft anchors are designated as the "SS" series. Mechanical properties are given on the facing page.

All anchor components are available with a hot-dip galvanized coating that meets the requirements of ASTM A153.

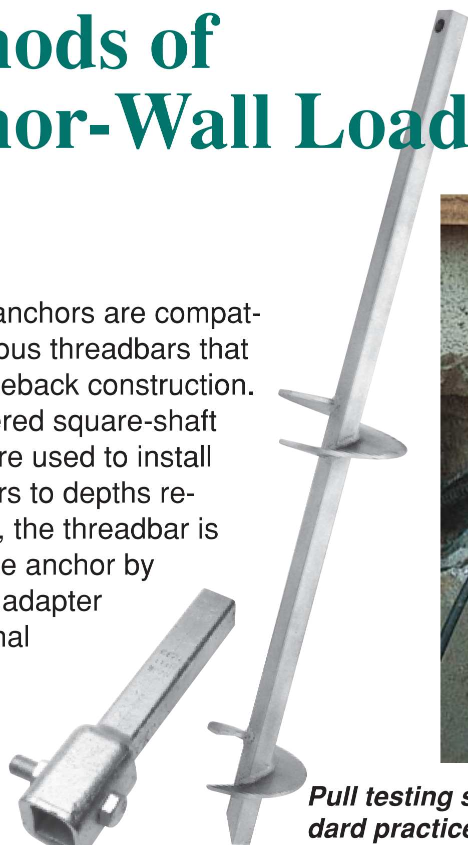
Installing Tools

For attachment to a torque-output source directly or via a torque-indicating device, SS anchor drive tool sizes are of the same basic design.

Catalog No.	Description	Weight	Attachment Flange
63900I	SS150 Tool	7 lb.	5¼" bolt circle for six ½" bolts
C303-0195	SS175 Tool	18 lb.	7⅝" bolt circle for six ⅝" bolts
C303-0201	SS200 Tool	30 lb.	7⅝" bolt circle for twelve ⅝" bolts
C303-0202	SS225 Tool	30 lb.	7⅝" bolt circle for twelve ⅝" bolts

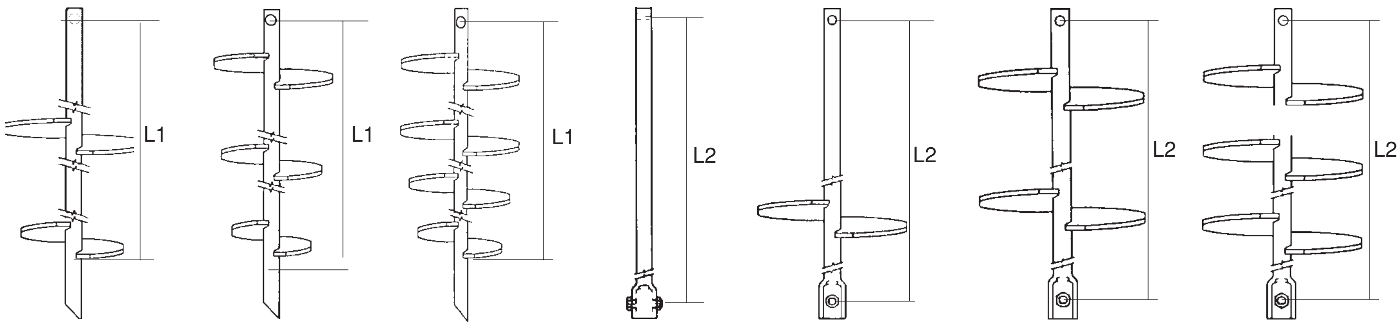
Methods of Anchor-Wall Load Transfer

Screw anchors are compatible with various threadbars that are used in tieback construction. Round-cornered square-shaft extensions are used to install screw anchors to depths required. Then, the threadbar is coupled to the anchor by means of an adapter with an internal thead for the appropriate threadbar design.

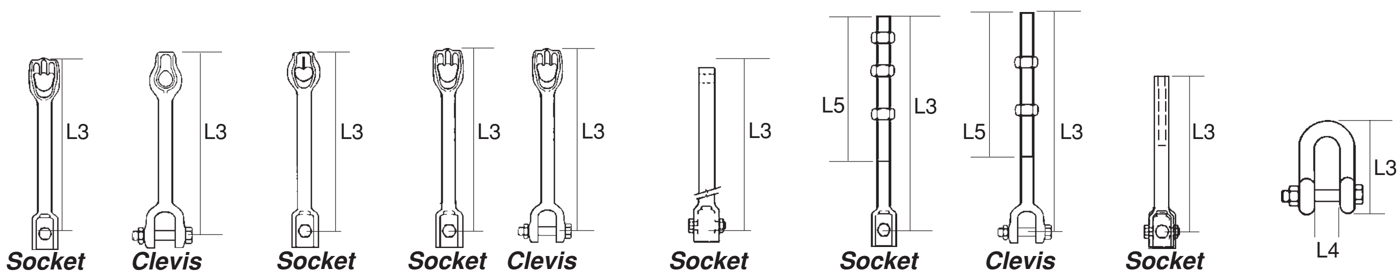


Pull testing serves as a check on analytical design procedures. Standard practice recommends all tieback anchors should be loaded after installation to eliminate deflection at working loads. A.B. Chance concurs with this practice when utilizing screw anchors.

Tieback
Anchor Selection



Two-Helix Lead Section | Three-Helix Lead Section | Four-Helix Lead Section | Plain Extension | Single-Helix Extension | Two-Helix Extension | Three-Helix Extension



Socket *Clevis* Thimbleye Adapter | *Socket* Twineye Adapter | *Socket* *Clevis* Tripleye Adapter | *Socket* Ovaleye Adapter | *Socket* *Clevis* Threaded Adapter | *Socket* Threadbar Adapter | Chain Shackle

Mechanical Ratings	SS 150 1.50" Square Shaft	SS 175 1.75" Square Shaft	SS 200 2.00" Square Shaft	SS 225 2.25" Square Shaft
Max. Installation Torque	7,000 ft.-lb.	10,000 ft.-lb.	15,000 ft.-lb.	20,000 ft.-lb.
Minimum Ultimate Tension Strength	70,000 lb.	100,000 lb.	150,000 lb.	200,000 lb.

Lead Sections **Helix Configuration and Diameter(s)**	Catalog Number and Length											
	SS 150			SS 175			SS 200			SS 225		
	Galv.	Non-Galv.	L1	Galv.	Non-Galv.	L1	Galv.	Non-Galv.	L1	Galv.	Non-Galv.	L1
8" & 10"	C110-0385	C114-0014	30"	C110-0227	C114-0020	30"	—	—	—	—	—	—
6", 8" & 10"	—	—	—	—	—	—	C110-0569	C114-0214	59"	C110-0543	C114-0187	53"
8", 10" & 12"	C110-0386	C114-0015	57"	C110-0235	C114-0021	58"	C110-0570	C114-0215	59"	C110-0544	C114-0188	73"
14", 14" & 14"	C110-0504	C114-0149	120"	C110-0505	C114-0084	123"	C110-0572	C114-0216	125"	C110-0545	C114-0190	113"
8", 10", 12" & 14"	—	C114-0100	120"	C110-0247	C114-0101	123"	C110-0573	C114-0217	125"	—	C114-0189	113"
Extension Sections	**Galv.**	**Non-Galv.**	**L2**	**Galv.**	**Non-Galv.**	**L2**	**Galv.**	**Non-Galv.**	**L2**	**Galv.**	**Non-Galv.**	**L2**
None	C110-0388	C114-0016	38"	C110-0136	C114-0022	37"	C110-0563	C114-0209	37"	C110-0645	C114-0243	40"
None	C110-0470	C114-0104	59"	C110-0137	C114-0105	59"	C110-0564	C114-0210	59"	C110-0646	C114-0244	52"
None	C110-0389	C114-0017	80"	C110-0138	C114-0023	80"	C110-0565	C114-0211	80"	C110-0647	C114-0245	72"
None	C110-0440	C114-0080	122"	C110-0140	C114-0081	123"	C110-0566	C114-0212	123"	—	—	—
Single 14" helix	C110-0471	C114-0108	45"	C110-0472	C114-0109	46"	C110-0577	C114-0220	46"	C110-0650	C114-0238	52"
Twin 14" helices	C110-0454	C114-0058	80"	C110-0450	C114-0057	80"	C110-0581	C114-0224	80"	C110-0652	C114-0252	72"
Triple 14" helices	C110-0475	C114-0112	122"	C110-0476	C114-0113	123"	C110-0586	C114-0231	123"	—	—	—

Termination Adapters	SS 150			SS 175				SS 200			SS 225		
	Galv.	L5	L3	Galv.	L5	L3	L4	Galv.	L4	L3	Galv.	L4	L3
Thimbleye Adapter (socket)	C102-0023	—	17"	—	—	—	—	—	—	—	—	—	—
Thimbleye Adapter (clevis)	—	—	—	T110-0311	—	17"	—	†T110-0312	—	17"	—	—	—
Twineye Adapter (socket)	C102-0024	—	17"	—	—	—	—	—	—	—	—	—	—
Tripleye Adapter (socket)	C102-0025	—	17"	—	—	—	—	—	—	—	—	—	—
Tripleye Adapter (clevis)	—	—	—	T110-0465	—	17"	—	†T110-0629	—	17"	—	—	—
Ovaleye Adapter (socket)	C110-0041	—	17"	—	—	—	—	—	—	—	—	—	—
Threaded Adapter (socket)	C110-0026	13½"	20"	—	—	—	—	—	—	—	—	—	—
Threaded Adapter (clevis)	—	—	—	T110-0352	36"	48"	—	—	—	—	—	—	—
	—	—	—	T110-0514	13½"	20"	—	—	—	—	—	—	—
Chain Shackle	—	—	—	T110-0134	—	6⅝"	1 13/16"	C110-0557	2¼"	8¼"	C110-0558	2⅜"	9"
1" Threadbar Adapter	C114-0009	—	11¼"	C114-0010	—	11½"	—	C114-0227	—	12½"	—	—	—
1¼" Threadbar Adapter	—	—	—	—	—	—	—	C114-0256	—	12½"	C114-0262	—	15"
1⅜" Threadbar Adapter	—	—	—	—	—	—	—	—	—	—	C114-0250	—	15"

†T110-0312 and T110-0629 each rated 70,000 lb. minimum ultimate tension strength.

Economic Benefits

A rate of 30 to 40 per day for installing and testing is not uncommon for contractors using Chance® anchors for tiebacks. Although always competitive, the Chance® tieback anchor is most attractive where caving soils otherwise would require casing and in high-water-table areas.

There are no holes to drill. Labor and equipment costs are cut. Under such circumstances, the contractor can obtain savings of 30 per cent while obtaining high anchor-load capacitites.

Construction problems that invite screw anchor solutions are:

• **Cohesive soils** often require either belled end or extremely-long grouted sockets to develop required loads. Screw anchors can develop the loads with bearing plates in the soil at much shallower depth. This means a faster, more economical total installation.

• **Non-cohesive soils** often require casing to assure even distribution of grout in the socket area. This is not a factor when using screw anchors. Screw anchors are displacement devices that act in a bearing mode instead of only a friction mode as is the case of grouted anchors.

• **Below-water-table** installations cause significant de-watering problems in installing grouted-type anchors. Screw anchors may offer reduced capacities, but they are predictable and require no special installation requirements. Installation torque has been used to indicate holding capacities where soil borings used for initial designs were found to be inaccurate.

• **Immediate testing** and loading of screw anchors can be a positive economic value in small projects requiring relatively few anchors or when the total excavation time is of importance.

Track hoe makes maneuverability easy at lakeside sheetpile repair job.

Conventional backhoe reaches into the low headroom under a highway overpass. Torque head driven by the hoe's hydraulics rapidly installs Chance® tiebacks for immediate loading.

Skid-steer excavator powers Chance® hydraulic drive head mounted on special adapter plate.

Lead-guided drill motors (crane-suspended or track-mounted) are common tieback drive equipment for large jobs.

Chance® portable power-drive heads can get into most remote and limited-access work spaces.

Advantages of the Chance® tieback anchor

- ✓ Competitive installing costs
- ✓ Immediate proof testing and loading — no waiting for grout to cure
- ✓ Installs in any weather
- ✓ Speeds excavation and construction
- ✓ Readily-available components
- ✓ Installs with available equipment
- ✓ Predictable results
- ✓ Permanent or temporary installation
- ✓ Removable
- ✓ Less equipment needed — no concrete trucks or grout pumps
- ✓ Labor saving — as few as four on a crew
- ✓ No spoils to remove

Write or call for information on any of these applications:

- Environmental walkways
- Marine mooring
- Foundation underpinning
- Tieback anchoring
- Soil nailing

DISCLAIMER: The material presented in this bulletin is derived from generally accepted engineering practices. Specific application and plans of repair should be prepared by a local structural/geotechnical engineering firm familiar with conditions in that area. The possible effects of soil (such as expansion, liquefaction and frost heave) are beyond the scope of this bulletin and should be evaluated by others. Hubbell assumes no responsibility in the performance of anchors beyond that stated in our SCS policy sheet on terms and conditions of sale.

NOTE: Because Hubbell has a policy of continuous product improvement, we reserve the right to change design and specifications without notice.

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